

**REMARKS**

Claims 1-16, 19-24, 26-41 and 44-49 are currently pending in the application.

Claims 1-16, 19-24, 26-41 and 44-49 stand rejected.

Applicant proposes to amend independent claims 1, 6, 10, 14, 20, 23, 26, 31, 35, 39, 45, and 46, and respectfully requests reconsideration of the application as proposed to be amended herein.

**Supplemental Information Disclosure Statement**

Please note that Supplemental Information Disclosure Statements were filed herein on August 22, 2002 and September 9, 2004, and that no copies of the PTO-1449 forms were returned with the outstanding Office Action. Applicants respectfully request that the information cited on the PTO-1449 forms be made of record herein. For the sake of convenience, a second copy of the August 22, 2002 and September 9, 2004, Supplemental Information Disclosure Statements, PTO-1449 forms with copy of cited references, and USPTO date-stamped postcards are enclosed herewith. It is respectfully requested that initialed copies of the PTO-1449 forms evidencing consideration of the cited references be returned to the undersigned attorney.

**35 U.S.C. § 103(a) Obviousness Rejections**

Obviousness Rejection Based on U.S. Patent 5,864,178 to Yamada et al. in view of U.S. Patent 4,388,132 to Hoge et al.

Claims 1 through 16, 19 through 24, 26 through 41 and 44 through 49 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Yamada et al. (U.S. Patent 5,864,178) in view of Hoge et al. (U.S. Patent 4,388,132). Applicant respectfully traverses this rejection, as hereinafter set forth.

M.P.E.P. 706.02(j) sets forth the standard for a Section 103(a) rejection:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, **the prior art reference (or references when combined) must teach or suggest all the claim limitations.**

The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). (Emphasis added).

Turning to the cited prior art Yamada et al. reference, teaches or suggests a semiconductor device comprising a wiring circuit board and a semiconductor chip mounted through a bump electrode on the circuit board, a space between the circuit board and the semiconductor chip as well as a periphery of the semiconductor chip being encapsulated with a resin containing filler. In FIGS. 56A through 56D a semiconductor chip 201 is mounted on a wiring circuit board 202 using bumps 203 with the semiconductor chip 201 having a layer of a first resin 204 constituting a laminate of encapsulation resin, a second layer of resin 205 on the wiring circuit board 202 constituting a laminate of encapsulation resin, a third encapsulation resin 206 constituting a laminate of encapsulation resin applied to a portion of the second layer of resin 205, a polymer film 207 formed on the semiconductor chip 201, and a polymer film 208 formed on the wiring circuit board 202. A passivation film 223 is formed on polymer film 208 which is excellent in wettability with the encapsulation resin, such as a hydrocarbon wax, a fatty acid type wax, a fatty amide type wax or an ester type wax. For example, an ester type wax such as carnauba wax or montan wax is preferable in view of their excellent moisture resistance. Other examples useful in Example VIII are a long chain carboxylic acid or a metal salt thereof, such as stearic acid, palmitic acid, zinc stearate and calcium stearate; and a low molecular polyethylene wax which may be applied singly or in combination thereof. Nowhere does Yamada et al. teach or suggest a semiconductor chip 201 having at least a portion of said active surface having a wetting agent layer of about a monolayer thick thereon, said wetting agent layer wettable by a polymeric material. At best, Yamada et al. describe that solely the first layer of encapsulation resin 204, second layer of encapsulation resin 205, and third encapsulation resin 206 may include a silane coupling agent therein mixed with the other components forming the layer of encapsulation resin. The silane coupling agent is only used in the formulation of the encapsulation resin itself, not separately applied to either the semiconductor chip or the wiring circuit board as a wetting agent layer. Nowhere in the Yamada et al. reference is there any

description whatsoever directed to any of the encapsulation resins 204, 205, and 206 acting as a wetting agent under any circumstances.

The Hoge et al. reference teaches or suggests the use of a coupling agent 60 applied to a film 20 prior to the film 20 contacting an adhesive 40 applied to a region 11 of a chip 10. Nowhere in the Hoge et al. reference is there any teaching or suggestion to apply the coupling agent 60 to the region 11 of the chip 10. Nowhere in Hoge et al. is there any teaching or suggestion to use the coupling agent 60 in conjunction which undergoes no substantial degradation thereof during a curing process for a material. The coupling agent in Hoge et al. is used with a thermoplastic adhesive and an adhesive which attains a fluid state by mixing a solvent, with hardening achieved by heating the structure to vaporize the solvent out of the mixture. Applicants assert that thermoplastic adhesive does not cure and an adhesive that hardens by heating the structure to vaporize the solvent out of the mixture does not cure. Applicants further assert that Hoge et al. does not teach or suggest that the coupling agent 60 is suitable for use in a process which must cure a material for the hardening thereof. Applicants assert that solely Applicants' disclosure teaches or suggests any such invention, not the cited prior art and not the Hoge et al. reference.

Applicant asserts that any combination of the Yamada et al. reference and the Hoge et al. reference establish a *prima facie* case of obviousness under 35 U.S.C. § 103 regarding the claimed inventions of independent claims 1, 6, 10, 14, 20, 23, 26, 31, 35, 39, 45, and 48 because any combination of such cited prior art, at the least, fails to teach or suggest all of the claim limitations of the claimed inventions and because the suggestion to make the claimed combination and the reasonable expectation of success are not found in the cited prior art but, are solely based on Applicant's disclosure.

For instance, Applicant asserts that the any combination of the Yamada et al. reference and the Hoge et al. reference does not teach or suggest the claim limitations of the claimed inventions set forth in independent claims 1, 6, 10, 14, 20, 23, 26, 31, 35, 39, 45, and 48 calling for "the semiconductor device having an active surface, at least a portion of said active surface having a wetting agent layer of about a monolayer thickness thereon comprising a layer of solely a silane-based material which undergoes no substantial degradation thereof during a curing

process for a material”, “a wetting agent layer provided on said active surface of said semiconductor device, said wetting agent layer having a thickness of about a monolayer comprising a layer of solely a silane-based material which undergoes no substantial degradation thereof during a curing process for a material”, “a wetting agent located on a portion of said active surface of said semiconductor device comprising a layer of solely a silane-based material which undergoes no substantial degradation thereof during a curing process for a material”, “a wetting agent layer provided on at least a portion of said active surface of said semiconductor device comprising a layer of solely a silane-based material which undergoes no substantial degradation thereof during a curing process for a material, the underfill material essentially filling a volume between said wetting agent layer and said upper surface of said substrate”, “a wetting agent layer provided on a portion of said active surface of said semiconductor device and a portion of said upper surface of said substrate, said wetting agent layer comprising a layer of solely a silane-based material which undergoes no substantial degradation thereof during a curing process for a material”, “a wetting agent layer provided on said active surface of said semiconductor device and on said upper surface of said substrate, said wetting agent layer comprising a layer of solely a silane-based material which undergoes no substantial degradation thereof during a curing process for a material”, “the semiconductor die having an active surface, at least a portion of said active surface having a wetting agent layer of about a monolayer in thickness thereon, said wetting agent layer wettable by a polymeric material, said wetting agent layer comprising a layer of solely a silane-based material which undergoes no substantial degradation thereof during a curing process for a material”, “a wetting agent layer provided on said active surface of said semiconductor die, said wetting agent layer having a thickness of about a monolayer and wettable by a polymeric material, said wetting agent layer comprising a layer of solely a silane-based material which undergoes no substantial degradation thereof during a curing process for a material”, “a wetting agent layer provided on a portion of said active surface of said semiconductor die and a portion of said upper surface of said substrate, said wetting agent layer comprising a layer of solely a silane-based material which undergoes no substantial degradation thereof during a curing process for a material”, and “a wetting agent layer provided on said active surface of said semiconductor die and on said upper surface of said

substrate, said wetting agent layer comprising a layer of solely a silane-based material which undergoes no substantial degradation thereof during a curing process for a material”.

In contrast to the claimed inventions, Applicant asserts that nowhere does the combination of the Yamada et al. reference and the Hoge et al. reference describe a wetting agent used on a portion of a semiconductor device, semiconductor die, or substrate in any manner. At best, the Yamada et al. reference discusses the use of silane coupling agent mixed with the other components forming the layer of encapsulation resin. The silane coupling agent is only used in the formulation of the encapsulation resin itself, not separately applied to either the semiconductor chip or the wiring circuit board. At best, the Hoge et al. reference teaches or suggests the use of a coupling agent applied to an adhesive, not a resin that must be cured. Applicants assert that the Hoge et al. reference contains no teaching or suggestion whatsoever for the use of the coupling agent with an encapsulation layer such as contained in the Yamada et al. reference. The claimed inventions of independent claims 1, 6, 10, 14, 20, 23, 25, 31, 25, 39, 45, and 48 are not directed to the use of a silane coupling agent in the formulation of an encapsulation resin or a coupling agent applied to the surface of an encapsulation resin containing a silane coupling agent in the formulation thereof. Therefore, any combination of the Yamada et al. reference and the Hoge et al. reference cannot and does establish a *prima facie* case of obviousness under 35 U.S.C. § 103 regarding the claimed inventions of independent claims 1, 6, 10, 14, 20, 23, 26, 31, 35, 39, 45, and 48. Accordingly, independent claims 1, 6, 10, 14, 20, 23, 25, 31, 25, 39, 45, and 48 are allowable as well as the dependent claims therefrom.

Further, Applicant asserts that any combination of the Yamada et al. reference and the Hoge et al reference is a hindsight reconstruction of the Applicant's claimed inventions by picking and choosing among the cited prior art based solely upon Applicant's disclosure because the cited prior art fails to suggest any reason for any combination thereof and, even if combined, does not teach or suggest the claimed inventions of independent claims 1, 6, 10, 14, 20, 23, 25, 31, 25, 39, 45, and 48. Such hindsight is evidenced by the attempted modification of the Yamada et al. reference to include the use of a coupling agent applied to an adhesive layer. The Yamada et al. reference contains no adhesive layer. Therefore, any combination of the Yamada et al. reference and the Hoge et al. reference cannot and does establish a *prima facie* case of

obviousness under 35 U.S.C. § 103 regarding the claimed inventions of independent claims 1, 6, 10, 14, 20, 23, 26, 31, 35, 39, 45, and 48. Accordingly, independent claims 1, 6, 10, 14, 20, 23, 25, 31, 25, 39, 45, and 48 are allowable as well as the dependent claims therefrom.

### **ENTRY OF AMENDMENTS**

The proposed amendments to claims 1, 6, 10, 14, 20, 23, 26, 31, 35, 39, 45, and 48 above should be entered by the Examiner because the amendments are supported by the as-filed specification and drawings and do not add any new matter to the application to comply with the provisions of 35 U.S.C. § 132. Applicants further request entry of this amendment because the amendment is timely filed, the amendment places the application in condition for allowance, and the amendment does not raise new issues or require a further search. Finally, if the Examiner determines that the amendments do not place the application in condition for allowance, entry is respectfully requested upon filing of a Notice of Appeal herein.

**CONCLUSION**

Claims 1-16, 19-24, 26-41 and 44-49 are believed to be in condition for allowance, and an early notice thereof is respectfully solicited. Should the Examiner determine that additional issues remain which might be resolved by a telephone conference, he is respectfully invited to contact Applicant's undersigned attorney.

Respectfully submitted,



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